The R-C circuit and the time constant

Review the textbook on RC Circuits:

- **Phys 1402**: Serway/Vuille: Section. 18.5, Active Figure 18.17, Quick Quiz 18.9
- **Phys 2426**: Serway/Jewett: Section 28.4, Active Figure 28.16, Quick Quiz 28.5

1. In Figure 1, with the capacitor originally uncharged, the recording starts (t = 0) at the moment the switch is closed by connecting to A. What is the voltage across the capacitor at t = 0? What is the voltage across the capacitor at t = ∞? Why?
   (V(0) = 0 because there is no charge on the capacitor; V(∞) = 1.2V because the capacitor is fully charged)

2. The switch in Figure 1 is flipped from point A to point B disconnecting the battery and the capacitor starts discharging. During the process of the discharge, is there a current flowing through the Resistor? What direction (leftward or rightward)?
   (Yes, there is a current flowing through the Resistor to the right)

3. During the process of the discharge, is there a current flowing through the Capacitor?
   (No, there is no current through the Capacitor)

4. In Figure 1, the capacitance of the capacitor is 5.00μF and the resistance of the resistor is 3.50MΩ. What is the time constant for this circuit?
   (17.5s)

5. In Figure 1, the capacitance of the capacitor is 5.00μF and the resistance of the resistor is 3.50MΩ. How long would it take to charge the capacitor up from zero to 63% of the battery voltage?
   (Close to one time constant = 17.5s)

6. If the resistance of the resistor from Figure 1 is adjusted from 3.50MΩ to a smaller value, how would it affect the time constant? Would the capacitor charge faster or slower?
   (It will lower the time constant; the capacitor will charge faster)

7. If the capacitance of the capacitor from Figure 1 is adjusted from 50μC to a larger value, how would it affect the time constant? Would the capacitor charge faster or slower?
   (It will increase the time constant; the capacitor will charge slower)

![Figure 1. RC Circuit](image)